Claims

1. A method for producing oxygen and rare gases by distillation in a column system comprising one medium-pressure column (K01), one low-pressure column (K02) and at least one auxiliary column (K05), in which method:

i) at least one stream of cooled and purified air (1) is sent to the medium-pressure column where it is separated;

ii) at least a first nitrogen-enriched stream (11) is withdrawn from the medium-pressure column and at least one portion of this stream is sent directly or indirectly to the low-pressure column;

iii) an intermediate stream (RL1) is withdrawn from an intermediate level of the medium-pressure column;

iv) a stream (RL2), enriched with oxygen relative to the intermediate stream, is withdrawn from the bottom of the medium-pressure column and sent to the bottom of the auxiliary column;

v) a nitrogen-rich stream (WN2) is withdrawn from the top of the low-pressure column;

vi) an oxygen-rich liquid stream (LO) is withdrawn from the low-pressure column as product, optionally after a vaporization step in order to form a gaseous product; and

vii) an oxygen-enriched stream (PURGE), which is also enriched with krypton and with xenon relative to the second oxygen-enriched stream, is withdrawn from the auxiliary column,

characterized in that the intermediate stream (RL1) is sent to the low-pressure column and at least one liquid stream (5, 15) containing at least 78 mol% nitrogen is sent as reflux to the auxiliary column.

2. A method as claimed in claim 1, in which the third oxygen-enriched stream (PURGE) is sent into the top of

a purification column (K90) and a fourth oxygen-enriched stream (MIXTURE) constituting a mixture enriched with krypton and xenon is withdrawn at least a few theoretical stages lower down in the column.

3. The method as claimed in either of the preceding claims, in which the liquid stream (5) sent as reflux to the auxiliary column (K05) is liquefied air and/or liquid enriched with nitrogen relative to a liquefied air stream sent to the medium-pressure column.

4. The method as claimed in one of the preceding claims, in which the bottom of the auxiliary column is heated by an overhead gas from an argon column (K10).

5. The method as claimed in claim 3 or 4, in which the liquefied air (5) and/or the liquid enriched with nitrogen relative to the air is produced by heat exchange with the oxygen-rich liquid stream (LO) coming from the bottom of the low-pressure column, optionally after a pressurization step.

6. The method as claimed in claim 3, in which the nitrogen-enriched liquid (15) contains at least 80 mol% nitrogen.

7. The method as claimed in claim 3, in which the liquefied air (5) does not come from the medium-pressure column.

8. The method as claimed in one of the preceding claims, in which the liquid stream (5, 15) sent to the top of the auxiliary column is richer in nitrogen than the intermediate stream.

9. The method as claimed in one of the preceding claims, in which at least 10% of the oxygen produced is withdrawn in liquid form from the low-pressure column.

10. A plant for producing oxygen and rare gases by distillation in a column system comprising at least one medium-pressure column (K01), one low-pressure column (K02) and one auxiliary column (K05), which plant comprises:

i) means (1) for sending at least one stream off cooled and purified air to the medium-pressure column where it is separated;

ii) means for withdrawing at least a first nitrogen-enriched stream (11) from the medium-pressure column and means for sending at least one portion of this stream directly or indirectly to the low-pressure column;

iii) means for withdrawing a nitrogen-rich stream (WN2) from the top of the low-pressure column;

iv) means for withdrawing an intermediate stream (RL1) from an intermediate level of the medium-pressure column;

v) means for sending a stream, richer in oxygen than the intermediate stream, from the medium-pressure column into the bottom of the auxiliary column;

vi) means for sending a liquid stream (5, 15) as reflux to the auxiliary column;

vii) means for withdrawing an oxygen-rich liquid stream (LO) from the bottom of the low-pressure column as product, optionally after a vaporization step in order to form a gaseous product; and

viii) means for withdrawing a third oxygen-enriched stream (PURGE), which is also enriched with krypton and with xenon relative to the second oxygen-enriched stream, from the auxiliary column,

characterized in that it includes means for sending, as reflux stream to the auxiliary column, liquefied air or a liquid stream enriched with nitrogen relative to a liquid air stream sent to the medium-pressure column.

11. The plant as claimed in claim 10, which includes a purification column (K90), means for sending the third oxygen-enriched stream (PURGE) into the top of the

purification column and means (MIXTURE) for withdrawing a fourth oxygen-enriched stream, constituting a mixture enriched with krypton and xenon, at least a few theoretical stages lower down in the column.

12. The plant as claimed in claim 10 or 11, which includes an exchange line in which the liquefied air and/or the liquid enriched with nitrogen relative to the air is produced by heat exchange with the oxygen-rich liquid stream coming from the bottom of the low-pressure column, optionally after a pressurization step.